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POSSIBILITY OF USING ORGANIC NITROGEN FERTILIZATION AS A PARTIAL SUBSTITUTE FOR MINERAL NITROGEN AND ITS EFFECT ON YIELD, BUNCH CHARACTERISTICS AND FRUIT SHELF LIFE OF FLAME SEEDLESS GRAPEVINES

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ABSTRACT

This study was carried out to disclose the possibility of replacing mineral fertilizer requirements of Flame seedless grapevines by organic fertilizer (chicken manure) and to study its effect on yield, bunch characteristics, shelf life and residues of NO_3^- and NO_2 in the juice of berries. Different levels of nitrogen 30, 40 and 50 nitrogen units/feddan were used. The experimental vines received different combinations of both mineral and organic N fertilizers as follows :

1- 100 % mineral N fertilizer.
2- 75 % mineral N fertilizer + 25 % organic N fertilizer.
3- 50 % mineral N fertilizer + 50 % organic N fertilizer.
4- 25 % mineral N fertilizer + 75 % organic N fertilizer.

This study revealed that replacing 75 % N mineral fertilizer requirements by organic fertilizer at 50 N units significantly increased leaf area, total chlorophyll, leaf nitrogen, potassium and phosphorus content. Also, this treatment increased the yield per vine, cluster weight and size, berry weight and size and juice volume, SSC, SSC/acid ratio and total anthocyanin in berry skin and decreased acidity. On the contrary, it decreased nitrate and nitrite in berry juice than mineral nitrogen fertilizer alone.

From this study, it is clear that using organic fertilizer as a partial substitute for mineral nitrogen of Flame seedless grapevine at 50 unit N/feddan had a positive effect on all characters measured. So, it can be recommend to use the treatment of 75 % organic fertilizer + 25 % mineral N fertilizer at the level of 50 N units/fed. as the best treatment under the experiment conditions. Since, it gave the highest yield with better cluster and berry characteristics.

INTRODUCTION

Seedless grapes are popular for fresh eating. During the last decades Flame seedless grapes have grown rapidly in popularity to become the second most popular table grape after Thompson seedless. The round shape of berries and the deep red, colour of berry skin are perhaps the most important characteristics of grapes, a critical component of table, juice and wine grapes that had also been linked to the antioxidant content, with a sweet-tart flavor and a pleasant crunch.

The relationship between grape yield, fruit quality and health seems to be complex and can be influenced by nitrogen fertilization.

Mineral fertilizers have been extensively used after the second world war.

The effect of mineral nitrogen fertilizer is usually direct and fast for plants. But, the excess of mineral nitrogen fertilizers causes a major pollution of ground water in nitrate. The NO_3^- increases with increasing fertilizer and is higher in summer crops than those harvested in spring (Maynard *et al*., 1976). Nitrogen fertilizer causes an accumulation of harmful residual substances, such as nitrate and nitrite in berries and leaves of grapevines (Montasser *et al*., 2003).

Organic fertilizers are added to vineyards for two reasons, firstly, as an alternative nutrient source to the manufactured fertilizer and secondly, to improve the physical nature of the soil (Barbarick, 2006). Moreover, it is often considered as a nitrogen source because the nitrogen is in the mineralization immobilization cycle longer and thus is more slowly available (Hallberg and Keeney, 1993). Also, organically grown vegetables have lower NO_3^- concentration than those grown under mineral fertilization (Isherwood, 2000).

The aim of this study is to throw some light on the possibility of using organic nitrogen fertilization as a partial substitute for mineral nitrogen and to study its effect on the yield, bunch and berry quality and the residues of nitrate and nitrite in berries of Flame seedless grapevines grown under Dakahlia conditions. The ultimate goal is to produce healthy fruits less polluted with chemical fertilizers, in addition, suitable for export with lower cost by involving organic fertilizers in fertilizer program of grape vineyards.

MATERIALS AND METHODS

This investigation was carried out during 2004, 2005 and 2006 seasons in EL-Baramoon Experimental farm, Dakahlia Governorate on mature Flame seedless grapevines. The vines were grown in a clay loamy soil under surface irrigation system spaced at 2 x 3 meters, and double cordon trained. All vines were pruned at the first week of January leaving 60 buds per vine. The aim of this study was to evaluate the possibility of using organic nitrogen fertilization as a partial substitute for mineral nitrogen and to study its effect on yield, bunch and berry quality and residues of NO_3^- and NO_2 in the berries of Flame seedless grapevines.

Before starting the experiment, soil samples were taken at depths of 0-30, 30-60 and 60-90 cm.

Physical and chemical properties of the experimental soil according to standard procedures as described by Page *et al*., (1982) are given in Table (1).

The experimental design was split-plot. The vines received 12 treatments with 3 replicates, 3 vines each. All vines were almost similar in vigor, healthy and were subjected to the normal horticultural practices already applied in the vineyard.

The treatments used in this study were 30, 40 and 50 nitrogen units/fed.

Table (1) : Soil physical and chemical characteristics :

Soil depth (cm)		E.C dS.m	pH (1.25)	Available nutrients (ppm)		
				N	P	K
0-30		0.61	7.8	35	13.2	381
30-60		0.64	7.9	30	12.7	325
60-90			8.0	29	12.0	325
Particle size distribution						
Soil depth (cm)	**Texture**	**Sand %**	**Silt %**	**Clay %**	**O.H %**	**$CaCO_3$**
0-30	Clay loam	32.8	21.4	39.5	1.8	2.5
30-60		33.1	22.3	40.3	1.8	2.5
60-90		33.2	22.2	40.5	1.8	2.3

The experimental vines received different combinations of both mineral N and organic fertilizers as follows :

1- 100 % mineral N fertilizer.
2- 75 % mineral N fertilizer + 25 % organic N fertilizer.
3- 50 % mineral N fertilizer + 50 % organic N fertilizer.
4- 25 % mineral N fertilizer + 75 % organic N fertilizer.

Ammonium sulfate (20.5 %) as a source of mineral fertilizer was added at three times : 25 % was added at growth onset, 50 % after fruit set and 25 % after harvest. The organic fertilizer (chicken manure) was added at the second week of January in both seasons in holes 50 cm length, 50 cm diameter and 50 cm depth at a distance of 50 cm from the vine trunk in two sides.

All guard vines and also borders were made between each replicate and block.

Super phosphate (15.5 % P_2O_5) was added to all vines at the same time of organic fertilization at 200 g/vine. The potassium fertilizer was applied to the soil as potassium sulphate (48 % K_2O) at 100 kg/fed. in two equal doses, the first dose was at the time of organic fertilization and the second after fruit set.

The following parameters were determined during this study as follows :

1-Average leaf area (cm^2) : after fruit set, the first fully mature leaves from the top of the shoot (6^{th} or 7^{th} leaf) were used for leaf area measurement using a planimeter according to EL-Sabrout (1998).
2-Chlorophyll pigments (mg/g) were determined after fruit set in the fully matured leaves as fresh weight according to Wettstein (1957).
3-Leaf mineral content : the concentrations of N, P and K in the petioles of leaves taken from the opposite side of the cluster were determined after fruit set. Total nitrogen content was determined according to micro-kjeldahl method as described by Cottenie *et al*. (1982). Phosphorus content was determined using the chlorostannous reduced molybdophoshoric blue colour method, (Cottenie *et al*., 1982). Potassium was determined by using a flame photometer according to the method described by Cottenie *et al*. (1982).
4-Yield : average yield (kg/vine) was recorded in the field at harvest when SSC reached about 17-18 % according to Tourky *et al*. (1995).
5-Physical and chemical characteristics of berries :

Cluster weight : Berry weight (g), 100 berry size (cm^3) and juice volume of 100 berries (cm^3) were estimated. Soluble solids content (SSC %) was recorded using a hand refractometer, total acidity percentage as tartaric acid (%) was also determined (A.O.A.C, 1985). SSC/acid ratio, total anthocyanin content of berry skin (mg/g fw) was also determined according to Husia *et al*. (1965). Nitrite and nitrate in berries were determined according to the method described by Singh (1988).

For storage studies (at harvest), the clusters were packed in perforated carton box (about 2 kg grapes) and kept at room temperature (about 25-30 ^{o}C) and relative humidity 45 %. Three replicates of each treatment were examined at 3 days in teval. Cluster weight loss, decay, shatter and total loss percentage were determined.

6-Statistical analysis :

Data of this study were statistically analyzed using the method outlined by Waller and Duncan (1969). Means of data obtained were compared using the New Least Significant Difference method (NLSD).

RESULTS AND DISCUSSION

This investigation was carried out during three successive seasons 2004, 2005 and 2006 and data for the last two seasons (2005 and 2006) were only considered in this study.

1- Leaf area :

Data presented in Table (2) indicated that increasing mineral nitrogenous fertilizer levels (from 30 to 50 units) significantly increased leaf area during the two seasons of the study. Treatment of 50 N units gave the highest values of average leaf area. these results are in agreement with those reported by EL-Boray *et al*. (2004) on Thompson seedless grapevines and Abbass *et al*. (2006) on Ruby seedless vines, they reported that the highest units of nitrogen gave the highest values of average leaf area.

The effect of nitrogen may be due to its important role in plant life and to its essential function in vegetative growth that it is being a part of protein, enzymes, amino acids, polypeptides and many essential compounds in plant system (Mengle and Kirkby, 1987).

As for the interaction between mineral nitrogen and organic fertilizer treatments, data in the same Table indicated that the highest leaf area was obtained from vines treated with 75 % organic manure + 25 % mineral fertilizer. The data go in line with those reported by Abou-Taleb (2004) on pecan trees and Belal (2006), who indicated that application of 60 units organic nitrogen + 20 units mineral nitrogen/fed. significantly increased leaf area as compared with the other applied treatments. The beneficial effect of organic manures on leaf area of plants might be related to the improvement of physical conditions of the soil, providing energy from microorganisms activity, increasing nutrient supply and improving the efficiency of macro elements as well as its ability to meet some micronutrient requirements (Cook, 1982; Tisdale *et al*., 1985; Kolble *et al*., 1995 and EL-Nagar, 1996).

Table (2): Effect of organic and mineral nitrogen fertilizers on leaf area (cm^2) and total chlorophyll (mg/g f.w) of Flame seedless grapevines during 2004, 2005 and 2006 seasons.

Treatments		Leaf area (cm^2)			Total chlorophyll (mg/g f.w)		
		2004	2005	2006	2004	2005	2006
100 % mineral N	30 N units	127.5	128.5	127.0	8.20	8.01	8.03
75 % M.N + 25 % O.M		130.6	129.5	131.0	8.20	8.10	8.20
50 % M.N + 50 % O.M		133.0	132.0	133.5	8.30	8.33	8.34
25 % M.N + 75 % O.M		135.0	134.5	136.0	8.40	8.50	8.55
100 % mineral N	40 N units	132.0	130.9	133.0	8.40	8.50	8.60
75 % M.N + 25 % O.M		133.5	132.5	139.0	8.45	8.57	8.70
50 % M.N + 50 % O.M		136.0	135.5	137.0	8.60	8.60	8.80
25 % M.N + 75 % O.M		138.5	138.0	138.0	8.70	8.80	8.90
100 % mineral N	50 N units	135.0	134.0	134.0	8.70	8.80	8.90
75 % M.N + 25 % O.M		136.5	135.5	137.0	8.96	8.95	8.98
50 % M.N + 50 % O.M		138.0	137.5	138.0	9.01	9.17	9.20
25 % M.N + 75 % O.M		141.5	140.5	142.0	9.30	9.42	9.45
N. L.S.D at 5 %		2.2	2.5	2.4	0.32	0.25	0.26

2- Chlorophyll content of leaves :

It is obvious from Table (2) that adding different levels of mineral nitrogen fertilizer resulted in significant differences in total chlorophyll. Data also show that 50 N units/fed. treatment gave the highest values of this parameter. The present results are in agreement with those found by EL-Boray *et al*. (2004) on Thompson seedless and Abbas *et al*. (2006) on Ruby seedless grapevines, who reported that increasing nitrogen fertilizer significantly increased chlorophyll content in leaves of Ruby seedless grapevines. Data also revealed that all combinations at various proportion of mineral N and organic N increased chlorophyll content of leaves than using N mineral fertilizer alone. The best result was obtained from 75 % organic N + 25 % mineral N treatment. The obtained results go in line with those reported by Belal (2006), who found that using different doses from organic manure and mineral N fertilizers significantly increased total chlorophyll in the leaves, the highest values were obtained from using 60 units of organic fertilizer + 20 units of mineral nitrogen per fed.

The beneficial effect of organic fertilizers in increasing total chlorophyll may be due to more uptake of nutrients such as nitrogen, magnesium and iron which are involved in chlorophyll formation as mentioned by Harhash and Abd EL-Nasser (2000).

3- NPK content of leaves :

Data in Table (3) clearly indicated that increasing mineral nitrogen from 30 to 50 units/fed. significantly increased nitrogen and potassium content in the leaves. Data also revealed that the highest nitrogen level (50 units) either alone or combined with organic nitrogen (75 % organic N + 25 % mineral nitrogen) gave the highest values of N, P and K than the other applied treatments. The lower units of mineral N alone (30 units/fed.) gave the lower N, P and K content in the two seasons of this study. The obtained results are in accordance with EL-Boray *et al*. (2004) with Thompson seedless grapevines and Abbas *et al*. (2006), who mentioned that the high level of nitrogen fertilization increased N, P and K content in leaf petioles of Ruby seedless grapevines.

Data in the same Table also indicated that all combinations of organic fertilizers and N mineral fertilizer increased leaf content of N, P and K; the highest values were obtained from (75 organic + 25 N mineral) compared with using N mineral alone. The results in this respect agreement with those of Darwish *et al*. (1996) on Roomy Red grapevines, Harhash and Abd EL-Nasser (2000) on Flame seedless grapevines, Abd EL-Hameed and Rabeea (2005) on Superior grapevines and Belal (2006) who mentioned that adding 60 units organic nitrogen from any source + 20 units mineral nitrogen/fed. gave the highest values of N, P and K content in the leaf petioles as compared with the other treatments used in Thompson seedless grapevines.

Table (3): Effect of organic and mineral nitrogen fertilizers on N, P and K content in leaf petioles of Flame seedless grapevines during 2004, 2005 and 2006 seasons.

Treatments		N %			P %			K %		
		2004	2005	2006	2004	2005	2006	2004	2005	2006
100 % mineral N	30 N units	2.47	2.53	2.54	1.32	1.35	1.35	0.21	0.21	0.21
75 % M.N + 25 % O.M		2.58	2.59	2.59	1.39	1.39	1.40	0.22	0.22	0.22
50 % M.N + 50 % O.M		2.61	2.61	2.61	1.41	1.44	1.45	0.22	0.22	0.22
25 % M.N + 75 % O.M		2.66	2.66	2.66	1.51	1.55	1.54	0.23	0.23	0.23
100 % mineral N	40 N units	2.59	2.60	2.60	1.42	1.43	1.45	0.22	0.23	0.22
75 % M.N + 25 % O.M		2.62	2.61	2.61	1.51	1.51	1.53	0.23	0.23	0.23
50 % M.N + 50 % O.M		2.68	2.69	2.70	1.59	1.61	1.62	0.23	0.23	0.23
25 % M.N + 75 % O.M		2.71	2.72	2.74	1.75	1.74	1.76	0.24	0.23	0.24
100 % mineral N	50 N units	2.65	2.68	2.68	1.61	1.61	1.61	0.23	0.23	0.23
75 % M.N + 25 % O.M		2.73	2.77	2.77	1.66	1.68	1.69	0.23	0.23	0.23
50 % M.N + 50 % O.M		2.81	2.83	2.85	1.73	1.74	1.74	0.24	0.24	0.24
25 % M.N + 75 % O.M		2.91	2.91	2.92	1.81	1.80	1.81	0.24	0.24	0.24
N. L.S.D at 5 %		0.013	0.010	0.010	0.010	0.011	0.010	0.004	0.004	0.004

The improving effect of organic manures on leaf content of nitrogen, phosphorus and potassium can be attributed to their influence manifested in increasing the organic matter in the soil (Nijjar, 1985) which by its turn increases the soil water holding capacity, which improves the solubility and consequently the availability of nutrients (Zaid and Kriem, 1992; EL-Kassas *et al*., 1997 and Nasser, 1998). Also, addition of organic manures leads to the production of humates which can be exchanged for adsorbed anions (Cook, 1982).

Effect of mineral and organic nitrogen fertilizers on yield/vine and cluster weight :

It is obvious from Table (4) that increasing mineral nitrogenous fertilizers from 30 to 50 N unit/fed. significantly increased the yield/vine, cluster weight and length. The high level of mineral nitrogen fertilizer either alone or combined with organic fertilizer gave the highest increase in yield/vine, cluster weight and length. Data also indicated that the best results were obtained from using 75 % organic nitrogen + 25 % mineral nitrogen treatment.

Table (4): Effect of organic and mineral nitrogen fertilizers on yield, cluster weight and length of Flame seedless grapevines during 2004, 2005 and 2006 seasons.

Treatments		Yield (kg/vine)			Cluster weight (g)			Cluster length (cm)		
		2004	2005	2006	2004	2005	2006	2004	2005	2006
100 % mineral N	30 N units	10.40	10.27	10.12	395	403	401	27.5	27.8	27.9
75 % M.N + 25 % O.M		10.66	10.63	10.71	410	414	409	28.1	28.2	28.1
50 % M.N + 50 % O.M		10.92	10.89	10.99	421	427	429	28.4	28.3	28.5
25 % M.N + 75 % O.M		11.70	10.44	11.57	445	445	450	28.9	29.1	29.0
100 % mineral N	40 N units	11.75	10.67	11.71	450	451	454	29.1	29.1	29.1
75 % M.N + 25 % O.M		12.25	12.22	12.22	470	469	469	29.5	29.5	29.6
50 % M.N + 50 % O.M		12.74	12.87	12.78	492	497	499	30.0	30.1	29.9
25 % M.N + 75 % O.M		13.00	13.07	13.04	502	507	501	30.1	30.1	30.0
100 % mineral N	50 N units	13.52	13.65	13.64	525	522	523	30.1	30.1	30.1
75 % M.N + 25 % O.M		13.81	13.78	13.81	531	536	536	30.6	30.5	30.8
50 % M.N + 50 % O.M		14.04	14.17	14.17	545	552	555	31.2	31.2	31.0
25 % M.N + 75 % O.M		15.08	15.16	15.15	583	585	590	31.7	31.7	31.7
N. L.S.D at 5 %		0.10	0.05	0.02	2.90	2.60	1.25	0.15	0.15	0.11

The increment in the yield and cluster weight & length by using high level of nitrogen fertilizer may be due to that nitrogen affects many functions in plant life being a part of protein, enzymes, nucleo proteins, amino acids and many other nitrogenous compounds in plant. Also, for some non-nitrogenous compounds such as cellulose and lignin, nitrogen is required to play an important role in building plant structure (Nijjar, 1985).

The obtained results are in accordance with those reported by EL-Boray *et al*., (2004) on Thompson seedless grapevines and Abbas *et al*., (2006) who mentioned that the highest level of nitrogen fertilization gave the highest yield compared with lowest level of nitrogen fertilizer in Ruby seedless grapevines.

The beneficial effects of using organic manures along with mineral nitrogen on increasing yield and cluster weight & length could be due to their effect in providing vines with their requirements from different nutrients at a longer time as well as their effect on increasing the availability of nutrients in the soil for uptake by plants and enhancing the nutritional status of the vines in favour of yield and cluster weight (Nijjar, 1985). Our data go in line with Darwish *et al*. (1996) on Roomy Red grapevines, Harhash and Abd EL-Nasser (2000) on King Ruby grapevines, Abd EL-Hameed and Rabeea (2005) on Superior seedless grapevines and Belal (2006), who indicated that adding 60 units organic nitrogen from any source + 20 units mineral nitrogen/ fed. gave the highest increase of cluster weight and yield/vine in Thompson seedless grapevines.

Berry weight and volume :

Table (5) shows that increasing mineral nitrogen levels from 30 to 50 units/fed. significantly increased berry weight and size of 100 berries. The treatment of 75 % nitrogen as organic source and 25 % of mineral nitrogen under 50 N units level recorded the highest values of all measurements as compared with the other treatments.

Data also indicated that the lowest level of mineral nitrogen fertilizer treatment alone (30 N unit) resulted in the lowest values in this respect. These results may be due to the effect of nitrogen on encouraging cell division and cell enlargement, Nijjar (1985). The positive effect of organic manure fertilizer treatments on berry weight and size may be due to the increase of organic matter content and improvement of the structure and physical properties of the soil (Gamal, 1992).

Table (5): Effect of organic and mineral nitrogen fertilizers on berry weight, size and berry juice volume of Flame seedless grapevines during 2004, 2005 and 2006 seasons.

Treatments		100 berry weight (gm)			100 berry juice volume (ml)			100 berry size (cm)		
		2004	2005	2006	2004	2005	2006	2004	2005	2006
100 % mineral N	30 N units	208.3	214.7	217.2	172.0	177.0	179.4	199.8	205.5	207.6
75 % M.N + 25 % O.M		222.8	227.5	231.9	186.1	190.3	194.1	218.2	216.2	221.2
50 % M.N + 50 % O.M		237.2	235.5	236.2	198.9	198.5	187.5	226.1	223.6	224.7
25 % M.N + 75 % O.M		244.1	251.0	254.5	202.9	211.8	215.6	232.1	239.9	243.6
100 % mineral N	40 N units	259.1	256.7	264.7	219.0	215.3	223.7	248.2	244.4	254.3
75 % M.N + 25 % O.M		263.0	268.0	268.7	223.6	227.0	228.3	253.4	255.4	257.0
50 % M.N + 50 % O.M		271.0	274.1	276.6	231.5	236.9	233.9	262.1	262.6	264.3
25 % M.N + 75 % O.M		277.0	278.6	279.2	239.1	239.5	239.4	268.6	266.4	269.2
100 % mineral N	50 N units	283.0	286.2	290.6	242.8	246.8	249.2	272.3	274.6	280.6
75 % M.N + 25 % O.M		294.0	295.1	299.0	255.6	256.2	258.2	284.3	289.7	287.4
50 % M.N + 50 % O.M		303.8	308.9	311.0	265.0	267.2	273.0	294.0	299.3	302.9
25 % M.N + 75 % O.M		319.8	319.3	326.2	281.5	281.4	285.1	307.1	309.7	313.3
N. L.S.D at 5 %		2.25	1.52	2.02	2.37	1.76	4.74	2.3	2.2	2.3

These results are in agreement with those obtained by Ahmed *et al*., (2000) on Flame seedless grapevines, Harhash and Abd EL-Nasser (2000) on Flame seedless and Belal (2006) who indicated that 60 units organic nitrogen + 20 units mineral nitrogen gave the highest values of cluster length, berry length and berry width as compared with the other treatments, especially in case of using mineral nitrogen alone.

SSC, acidity and SSC/acid ratio :

Data in Table (6) clearly show that SSC and SSC/acid ratio increased significantly by increasing the units of mineral nitrogen. Data also revealed that replacing nitrogen requirements for the vines by organic N gave a significant increase in SSC and SSC/acid ratio, while reduced total acidity compared with using N totally as a mineral source. In addition, the highest SSC and SSC/acid ratio were obtained from using 75 % organic nitrogen + 25 % mineral nitrogen treatment at 50 units/feddan treatment and also recorded the lowest acidity values.

Table (6): Effect of organic and mineral nitrogen fertilizers on soluble solids content, acidity and soluble solids content/acid ratio of Flame seedless grapevines during 2004, 2005 and 2006 seasons.

Treatments		SSC %			Acidity %			SSC/acid ratio		
		2004	2005	2006	2004	2005	2006	2004	2005	2006
100 % mineral N	30 N units	17.2	17.1	17.2	0.737	0.731	0.696	23.3	23.4	24.8
75 % M.N + 25 % O.M		17.5	17.5	17.5	0.696	0.693	0.679	25.1	25.2	25.8
50 % M.N + 50 % O.M		17.6	17.7	17.8	0.667	0.666	0.663	26.5	26.6	26.9
25 % M.N + 75 % O.M		17.9	17.9	18.1	0.641	0.652	0.648	27.9	27.5	27.9
100 % mineral N	40 N units	17.9	18.2	18.1	0.626	0.631	0.644	28.6	28.8	28.1
75 % M.N + 25 % O.M		18.7	18.7	18.5	0.614	0.616	0.613	29.5	30.4	30.1
50 % M.N + 50 % O.M		18.2	18.5	18.3	0.605	0.601	0.606	30.0	30.8	30.1
25 % M.N + 75 % O.M		18.5	18.5	18.6	0.596	0.598	0.595	31.0	31.0	31.3
100 % mineral N	50 N units	18.3	18.2	18.3	0.597	0.592	0.592	30.7	30.8	30.9
75 % M.N + 25 % O.M		18.4	18.5	18.8	0.582	0.588	0.584	31.6	31.4	32.1
50 % M.N + 50 % O.M		19.1	18.7	18.8	0.565	0.565	0.558	33.8	34.1	33.7
25 % M.N + 75 % O.M		18.9	18.9	18.9	0.552	0.552	0.552	34.3	34.3	34.3
N. L.S.D at 5 %		0.12	0.21	0.24	0.007	0.006	0.008	0.38	0.55	0.57

This result may be due to that organic manure (as slow release for nitrogen) induced a further reduction in NO_3-N accumulation in the plant compared with mineral nitrogen (as fast release of nitrogen). Increasing nitrogen enhances photosynthesis, which means that more sugar (glucose) is available for growth and fruit ripening (Keller *et al*., 1998).

Our data are in agreement with Harhash and Abd EL-Nasser (2000) and Belal (2006) who found the gradual increasing of organic nitrogen doses to 60 units with decreasing the dose of mineral nitrogen to 20 units gave the highest significant increase of SSC %, SSC/acid ratio and lowest significant decrease of total acidity of Thompson seedless grapevines.

Total anthocyanin content of berry skin :

Data in Table (7) show that replacing N requirements of Flame seedless grapevines by organic fertilizers significantly increased total anthocyanin content in the skin of berries in comparison with mineral nitrogen alone. Moreover, the higher units of nitrogen (50 N units) at 75 % organic N + 25 % mineral N gave the highest values in this respect.

These results may be due to that nitrogen content in leaves has a high degree of correlation with the rate of photosynthetic activity (De Jong, 1982). The obtained data are in agreement with Abbas *et al*. (2006), who indicated that the highest levels of N application of biofertilizer resulted in a significant increase in total anthocyanin in the skin of berries compared with nitrogen units without the biofertilizer in King Ruby grapevines.

Table (7): Effect of organic and mineral nitrogen fertilizers on berry content of total anthocyanin, nitrate and nitrite of Flame seedless grape- vines during 2004, 2005 and 2006 seasons.

Treatments		Anthocyanin (mg/g f.w)			Nitrite (ppm)			Nitrate (ppm)		
		2004	2005	2006	2004	2005	2006	2004	2005	2006
100 % mineral N	30 N units	0.473	0.483	0.490	1.53	1.51	1.46	16.23	16.35	16.43
75 % M.N + 25 % O.M		0.533	0.553	0.563	1.27	1.29	1.23	15.91	16.00	15.88
50 % M.N + 50 % O.M		0.620	0.657	0.667	1.10	1.04	1.01	14.88	14.67	14.74
25 % M.N + 75 % O.M		0.713	0.743	0.760	0.00	0.02	0.01	12.30	12.63	12.79
100 % mineral N	40 N units	0.540	0.557	0.550	3.38	3.26	3.23	16.89	16.85	16.76
75 % M.N + 25 % O.M		0.663	0.677	0.683	3.04	3.01	3.01	16.21	16.22	16.26
50 % M.N + 50 % O.M		0.703	0.717	0.720	3.21	2.12	3.15	15.17	15.06	15.09
25 % M.N + 75 % O.M		0.820	0.840	0.833	0.87	0.83	0.89	13.92	13.83	13.91
100 % mineral N	50 N units	0.653	0.643	0.643	4.42	4.33	3.40	17.59	17.76	17.61
75 % M.N + 25 % O.M		0.747	0.773	0.783	3.41	3.37	3.08	17.04	17.11	17.04
50 % M.N + 50 % O.M		0.823	0.837	0.853	2.01	2.66	2.63	16.47	16.52	16.19
25 % M.N + 75 % O.M		0.930	0.917	0.943	2.08	2.07	2.06	15.41	15.40	15.34
N. L.S.D at 5 %		0.012	0.011	0.013	0.11	0.04	0.04	0.12	0.10	0.10

Nitrate and nitrite content :

Results presented in Table (7) revealed that increasing mineral N-units/vine significantly increased nitrate and nitrite content in the juice of berries. Data also indicated that replacing nitrogen requirements for the vines by organic nitrogen gave a significant decrease of nitrate and nitrite in berry juice. It is worthy to note that, 75 % organic N + 25 % mineral N treatment gave the lowest levels (12.6 and 12.79) of nitrate and (0.02 and 0.01) of nitrite as compared with the other treatments used.

This may be due to that using organic manure fertilizer is often considered as a desirable nitrogen source because the nitrogen is in the mineralization immobilization cycle longer and thus is more slowly available (Hallberg and Keeney, 1993). Moreover, the use of organic manure (as slow release for nitrogen) induced a further reduction in NO_3-N accumulation in the plant compared with mineral nitrogen (as fast release for nitrogen) EL-Sisy, 2000. The obtained data are in agreement with those reported by Harhash and Abd EL-Nasser and Belal (2006), who reported that the interactions of all combinations between organic nitrogen plus mineral nitrogen doses gave a significant decrease in nitrate and nitrite content in the juice of berries as compared with mineral nitrogen alone for Thompson seedless grapevines.

Weight loss percentage :

It is clear from Table (8) that cluster weight loss percentage was gradually increased during shelf period. The high level of N-fertilization treatments significantly increased weight loss percentage than the lower level of N-application treatments.

Table (8): Effect of organic and mineral nitrogen fertilizers on loss in weight% during room storage of Flame seedless grapevines.

Treatments		2004			2005			2006		
		3 days	6 days	9 days	3 days	6 days	9 days	3 days	6 days	9 days
100 % mineral N	30 N units	4.6	9.4	12.5	5.7	10.2	14.1	4.8	9.6	12.7
75 % M.N + 25 % O.M		4.4	9.4	12.5	5.7	10.3	14.3	4.8	9.7	12.7
50 % M.N + 50 % O.M		4.5	9.4	12.5	5.8	10.2	14.4	4.8	9.8	12.8
25 % M.N + 75 % O.M		4.5	9.4	12.6	5.8	10.2	14.3	5.0	9.8	12.8
100 % mineral N	40 N units	5.1	10.4	14.6	6.7	12.3	16.5	5.7	10.9	14.6
75 % M.N + 25 % O.M		5.1	10.5	14.7	6.7	12.2	16.4	5.8	11.0	14.7
50 % M.N + 50 % O.M		5.1	10.3	14.6	6.8	12.3	16.5	5.9	11.0	14.8
25 % M.N + 75 % O.M		5.2	10.5	14.7	6.8	12.2	16.6	6.0	11.0	14.8
100 % mineral N	50 N units	5.5	11.5	16.5	7.6	13.6	18.4	6.6	11.6	16.8
75 % M.N + 25 % O.M		5.6	11.5	16.5	7.6	13.7	18.5	6.7	11.7	17.0
50 % M.N + 50 % O.M		5.6	11.5	16.7	7.6	13.7	18.7	6.6	11.8	17.1
25 % M.N + 75 % O.M		5.5	11.5	16.7	7.7	13.7	18.8	6.7	11.9	17.2
N. L.S.D at 5 %		0.3	0.9	1.8	0.8	1.1	1.7	0.5	0.6	0.5

Furthermore, no significant differences could be detected between organic and mineral N fertilizer treatments.

Shattering percentage :

Data of Table (9) indicated that shattering percentage was increased with the advance of storage period at room temperature. Data also revealed that the lowest level of shattering percentage was obtained from the lowest level of N units treatments.

Table (9): Effect of organic and mineral nitrogen fertilizers on shattering % during room storage of Flame seedless grapes.

Treatments		2004			2005			2006		
		3 days	6 days	9 days	3 days	6 days	9 days	3 days	6 days	9 days
100 % mineral N	30 N units	5.5	10.3	16.4	6.3	11.2	17.6	5.9	10.8	16.0
75 % M.N + 25 % O.M		5.4	10.3	16.5	6.4	11.3	17.6	5.8	10.9	16.1
50 % M.N + 50 % O.M		5.5	10.4	16.6	6.4	11.4	17.8	6.0	10.9	16.2
25 % M.N + 75 % O.M		5.6	10.4	16.5	6.5	11.4	17.9	6.1	11.0	16.2
100 % mineral N	40 N units	6.3	12.5	18.2	7.6	13.7	19.5	6.8	12.4	17.6
75 % M.N + 25 % O.M		6.3	12.5	18.4	7.7	13.8	19.6	6.7	12.3	17.7
50 % M.N + 50 % O.M		6.5	12.7	18.5	7.8	13.8	19.6	7.0	12.3	17.7
25 % M.N + 75 % O.M		6.6	12.7	18.5	7.8	13.9	19.7	7.1	12.4	17.8
100 % mineral N	50 N units	7.8	14.5	20.3	8.6	16.4	21.5	8.3	13.7	19.9
75 % M.N + 25 % O.M		7.6	14.6	20.3	8.6	16.6	21.4	8.2	13.8	20.0
50 % M.N + 50 % O.M		7.8	14.6	20.3	8.6	16.7	21.4	8.4	13.8	20.0
25 % M.N + 75 % O.M		7.8	14.6	20.4	8.6	16.7	21.6	8.5	13.8	20.1
N. L.S.D at 5 %		0.7	1.8	1.6	1.1	2.3	0.6	0.7	1.2	1.4

Decay percentage :

Data presented in Table (10) indicated that decay percentage increased as the storage period advanced. The lower level of N-units (30 N-units) significantly decreased the decay in the three seasons of the study, while the high level of N-units (50 N-units) significantly increased decay percentage than the other used treatments. Data also revealed that no significant differences could be detected between organic or mineral nitrogen fertilization treatments.

Total loss percentage :

It is obvious from Table (11) that the total loss including cluster weight loss, due to berry shattering and decay significantly increased at the end of the storage period. Tourky *et al*. (1995) mentioned that the maximum storage life of Flame seedless grapes was 9 days at room temperature.

The same Table indicated that 50 N-units treatments gave significant increase in total loss percentage and gave the highest degree in this respect than other treatments used.

Table (10): Effect of organic and mineral nitrogen fertilizers on decay % during room storage of Flame seedless grapes.

Treatments		2004			2005			2006		
		3 days	6 days	9 days	3 days	6 days	9 days	3 days	6 days	9 days
100 % mineral N	30 N units	2.5	5.7	8.5	2.7	5.9	7.8	2.9	6.1	8.7
75 % M.N + 25 % O.M		2.6	5.6	8.5	2.7	5.9	7.7	2.9	6.2	8.8
50 % M.N + 50 % O.M		2.3	5.6	8.6	2.8	6.0	7.9	2.9	6.1	8.8
25 % M.N + 75 % O.M		2.5	5.7	8.6	2.8	6.0	7.8	2.9	6.2	8.9
100 % mineral N	40 N units	3.0	6.1	9.2	3.4	6.5	8.5	3.5	6.6	9.6
75 % M.N + 25 % O.M		3.0	6.2	9.4	3.3	6.6	8.7	3.5	6.6	9.7
50 % M.N + 50 % O.M		3.0	6.3	9.4	3.4	6.5	8.7	3.6	6.7	9.7
25 % M.N + 75 % O.M		2.8	6.4	9.5	3.5	6.6	8.7	3.5	6.7	9.9
100 % mineral N	50 N units	3.7	7.5	10.4	3.8	7.2	9.8	4.1	7.5	10.7
75 % M.N + 25 % O.M		3.7	7.5	10.5	3.9	7.2	9.7	4.2	7.6	10.7
50 % M.N + 50 % O.M		3.8	7.6	10.5	3.9	7.3	9.8	4.2	7.6	10.9
25 % M.N + 75 % O.M		3.7	7.6	10.6	3.9	7.3	9.9	4.3	7.7	10.9
N. L.S.D at 5 %		0.3	0.9	1.8	0.8	1.1	1.7	0.5	0.6	0.5

Table (11): Effect of organic and mineral nitrogen fertilizers on total loss percentage during room storage of Flame seedless grapes.

Treatments		2004			2005			2006		
		3 days	6 days	9 days	3 days	6 days	9 days	3 days	6 days	9 days
100 % mineral N	30 N units	12.5	25.1	37.4	14.7	27.3	39.5	13.5	26.5	37.4
75 % M.N + 25 % O.M		12.2	25.4	37.5	14.8	27.5	39.7	13.6	26.7	37.6
50 % M.N + 50 % O.M		12.3	25.4	37.7	15.0	27.6	40.7	13.7	26.8	37.5
25 % M.N + 75 % O.M		12.6	25.6	37.7	15.1	27.6	40.0	14.0	26.9	37.5
100 % mineral N	40 N units	14.4	29.0	42.1	17.7	32.4	44.5	16.0	29.9	41.7
75 % M.N + 25 % O.M		14.3	29.2	42.5	17.7	32.6	44.7	16.0	30.0	42.1
50 % M.N + 50 % O.M		14.7	29.3	42.5	18.0	33.6	44.8	16.5	30.0	42.3
25 % M.N + 75 % O.M		14.8	29.6	42.7	18.0	32.8	45.1	16.6	30.0	42.4
100 % mineral N	50 N units	16.7	32.7	47.2	20.1	37.1	49.7	19.0	32.8	47.4
75 % M.N + 25 % O.M		16.8	33.5	47.3	20.2	37.5	49.6	19.1	32.8	47.8
50 % M.N + 50 % O.M		17.0	33.7	47.4	20.1	37.7	49.9	19.2	33.2	48.0
25 % M.N + 75 % O.M		17.0	33.7	47.6	20.2	37.6	50.2	19.5	33.4	48.2
N. L.S.D at 5 %		1.7	1.3	1.5	1.9	1.3	1.8	1.0	1.8	2.0

Economical evaluation of the yield :

Data in Table (12) indicate that the average yield of nitrogen fertilizer treatments reached 10.40, 10.69, 11.06, 11.62, 11.75, 12.2, 12.96, 13.08, 13.60, 13.90, 14.28 and 15.23 tons respectively for the first, second, third, fourth, fifth, sixth, seventh, eighteenth, ninth, tenth, eleventh and twelfth treatment each of which represents approximately 83.2 %, 85.52 %, 88.48 %, 92.97 %, 94.0 %, 97.6 %, 103.68 %, 104.64 %, 108.8 %, 111.2 %, 114.24 % and 121.84 % respectively of the average farm yield per feddan compared with 12.5 tons of the average farm productivity, which means that seventh, eighteenth, ninth, tenth, eleventh and twelfth fertilization treatments had excelled as a productive about 3.68 %, 4.64 %, 8.8 %, 11.2 %, 14.24 and 41.82 % respectively, while, the first, second, third fourth, fifth and sixth treatments achieved a relative reduction amounting to 16.8 %, 14.48 %, 11.52 %, 7.04 % and 2.4 % respectively.

In addition, it could be concluded that the importance of applying organic fertilizer and minimizing the quantities used of mineral nitrogen fertilizer in Flame seedless vineyards can be ascribed to the role of organic fertilizer in decreasing to a great extent the degree of pollution. Accordingly, the grape grower gets higher prices for his production in comparison with that obtained from vines fertilized with N mineral fertilizer only.

Table (12) : Some indicators of economic productivity of some nitrogen fertilizer treatments on Flame seedless grapevines during (2004, 2005 and 2006).

Statement / Treatments	Treat. No.	Feddan productivity		Total revenue f./pound (1)	Fertilization costs f./pound (2)	(1)-(2)	Net revenue tons fertilization of control
		Tons	Total figure %				
Control	---	12.50	100	12500	240	12260	---
100 % mineral N	First	10.40	83.2	10400	120	10280	- 1980
75 % M.N + 25 % O.M	Second	10.69	85.52	10.690	210	10480	- 1780
50 % M.N + 50 % O.M	Third	11.06	88.48	14378	300	14078	+ 1818
25 % M.N + 75 % O.M	Fourth	11.62	92.96	15106	390	14716	+ 2456
100 % mineral N	Fifth	11.75	94.0	11750	160	11590	- 670
75 % M.N + 25 % O.M	Sixth	12.2	97.6	12200	280	11920	- 340
50 % M.N + 50 % O.M	Seventh	12.96	103.68	16848	400	16448	+ 4188
25 % M.N + 75 % O.M	Eighteenth	13.08	104.64	17004	520	16484	+ 4224
100 % mineral N	Ninth	13.60	108.8	13600	200	13400	+ 1140
75 % M.N + 25 % O.M	Tenth	13.90	111.2	13900	350	13550	+ 1290
50 % M.N + 50 % O.M	Eleventh	14.28	114.24	18564	500	18664	+ 5804
25 % M.N + 75 % O.M	Twelfth	15.23	121.84	19929	650	19279	+ 7019

Average price peasants = 1300 pounds/f. organic fertilizer and 1000 pounds/f. for yield fertilizer mineral and organic.

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إمكانية إستخدام الأزوت العضوى كبديل جزئى للأزوت المعدنى وتأثير ذلك على محصول وصفات العنب الفيليم سيدلس

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****قسم الفاكهة – كلية الزراعة – جامعة المنصورة**

أجرى هذا البحث لدراسة إمكانية إحلال التسميد العضوى كبديل جزئى للأسمدة الأزوتية المعدنية بهدف تقليل الأثر الضار من الأسمدة النتروجينية المعدنية لإنتاج ثمار صحية صالحة للتصدير وذات عائد إقتصادى بالنسبة للعنب الفيليم سيدلس.

إستخدم سلفات النشادر كمصدر للنيتروجين المعدنى بثلاث معدلات ٣٠ ، ٤٠ ، ٥٠ وحدة أزوت للفدان مع إستبدال الأسمدة العضوية وكانت المعاملات كالآتى :

1- ١٠٠ % أزوت معدنى.
2- ٧٥ % أزوت معدنى + ٢٥ % سماد عضوى.
3- ٥٠ % أزوت معدنى + ٥٠ % سماد عضوى.
4- ٢٥ % أزوت معدنى + ٧٥ % سماد عضوى.

وقد أوضحت النتائج أن ٥٠ وحدة نتروجين للفدان في صورة ٢٥ % سماد معدنى + ٧٥ % نتروجين عضوى أدى إلى زيادة معنوية فى كل من المساحة الورقية ومحتوى الأوراق من الكلوروفيل وكمية المحصول ووزن العنقود وكذلك وزن وحجم الحبات وحجم العصير والمواد الصلبة الذائبة وتركيز صبغة الأنثوسيانين فى قشرة الحبات.

وأوضحت الدراسة أيضاً أن المعدلات المرتفعة من الأسمدة النتروجينية أدت إلى زيادة فى محتوى الثمار من النترات والنتريت بينما إنخفض هذا المحتوى بإستبدال الأسمدة النتروجينية بالأسمدة العضوية. وأنه كلما زادت نسبة الأسمدة العضوية كلما قل محتوى النتريت والنترات معنوياً.

وقد أوضحت النتائج أن تسميد العنب الفيليم سيدلس بمعدل ٥٠ وحدة نتروجين للفدان فى صورة (٢٥ % سماد معدنى + ٧٥ % سماد عضوى) أعطى أعلى القيم حيث حقق تفوقاً إنتاجياً يمثل حوالى ٢١.٨ % من متوسط إنتاجية الفدان المزرعى ، وكذلك الحصول على محصول صحى آمن خالى من الملوثات.